The Role of Family Networks, Coyote Prices and the Rural Economy in Migration From Western Mexico: 1965–1994

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ABSTRACT

The Mexico-U.S. wage gap alone cannot explain the large increases in migration from Mexico to the U.S. in the last three decades. This paper explores three alternative migration determinants: family migrant networks, the Mexican migrant-smuggling (coyote) industry and the rural economy. The premise of this paper is that successive cohorts of migrants and an expanding coyote industry have led to declines in the costs of migration partly through the formation of networks, while the long-term decline of the rural economy has led to increases in the gains to U.S. migration. Using unique, source-country data collected by the Mexican Migration Project from both migrant and non-migrant households in western Mexico, this paper estimates how the probability of migrating is influenced by the above determinants in two ways. First, the effect of coyote prices and economic output are estimated using an instrumental variables strategy in which coyote prices are instrumented for using border enforcement hours. Second, family network effects are estimated controlling for individual fixed effects. My findings suggest that sibling networks are by far the most significant determinant of initial migration, although falling coyote prices and worsened economic conditions have also been significant push/pull factors in out migration from western Mexico over this time period.

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JEL Classification: F22, J10, J61, R23

I. INTRODUCTION

In the last three decades, there have been unprecedented flows of migrants from Mexico to the United States. These flows have been composed largely of less-skilled individuals migrating illegally in pursuit of both temporary and permanent U.S. employment. By Census Bureau estimates, the 1997 Mexican-born population of the U.S. numbered over 7 million people, with Mexicans making up 27% of the total foreign-born population.[1] Also in 1997, the INS estimated that 2.7 million Mexicans resided in the U.S. illegally. With the net annual inflow estimated at 275,000, the 1999 population of undocumented Mexican-born immigrants is close to 3.3 million. The statistics together imply that, among Mexican-born U.S. residents, over 40% are currently undocumented. In addition, the INS estimates that another 2 million Mexicans constantly rotate in and out of the U.S. as seasonal agricultural laborers. In sum and by conservative estimates, 10% of the Mexican population is actively migrating to or residing in the U.S.

The natural question to ask is what conditions have given rise to the increase in Mexico-U.S. migration in recent decades. This entails looking at both the cost and benefits side of Mexico-U.S. migration. There have been significant developments in both. The premise of this paper is that costs of migration have fallen steadily over time as a result of expanding migrant networks and a fast-growing migrant-smuggling ('coyote') industry, while benefits to U.S. migration have increased steadily due to worsened economic conditions in both rural and urban Mexico.[2]

On the cost side of migration, the expansion of migrant networks and the growth of the coyote industry represent long-term developments that reduce the cost of Mexico-U.S. migration. The proliferation of migrant networks has a snowball effect, with each migrant lowering costs for successive migrants by providing newcomers with room and board, loans, and information about job opportunities. The surge in migration and the development of road infrastructure has also resulted in a flourishing smuggling industry

[1] Current Population Survey, March 1997. It is likely that surveys such as the CPS undercount illegal immigrants, hence the actual number of Mexican-born immigrants is probably larger than that reported here. The Census Bureau, for example, estimates that it missed 8.4 million people in the 1990 Census (LA Times 1/22/98). Martin (1993) shows evidence of gross undercounting by the CPS among agricultural workers.

in which 'coyotes' facilitate Mexico-U.S. border-crossings that, without their help, would be even more risky.

On the benefits side of the migration equation, adverse Mexican economic conditions exacerbate the Mexico-U.S. wage gap, increasing the benefits to migration. Economic downturns in Mexico periodically lead to a decreased demand for labor, wage declines, and increased unemployment. In rural areas, low commodities prices or severe weather patterns and low yields have similar impacts on income and employment. The extent to which migration is impacted depends upon the scope and severity of the downturn. Depending on the impacted sector, the shock can be limited to certain regions or it can be nationwide. If migration propensities are the highest in rural areas and the agricultural sector is most vulnerable to shocks, then downturns in rural economies can be expected to have a large impact on migration.

This research touches on many important issues. Understanding network effects is important in that it is a powerful predictor of both the geographic and skill distribution of migrants in the U.S. and in Mexico. Findings on networks also address the impact of U.S. immigration policy such as the family reunification emphasis in visa allocation, a policy that has come under increasing scrutiny (Borjas 1990,1995; Jasso and Rosenzweig 1986). The role of coyote prices in undocumented immigration has implications for what border patrol strategies are likely to be effective. Coyote price time series offer clues as to whether enforcement to date has been successful in increasing the risk and hence the costs of smuggling migrants. Finally, the existing evidence on the role of economic conditions in rural migration is contradictory. One example of recent research that finds evidence of pro-cyclical migration out of the Mexican countryside is Lindstrom's 1996 paper. Pinpointing the role of Mexican economic conditions in migration is important because it speaks more generally to the impact U.S. foreign policy (such as loan bailouts and NAFTA) might have on mitigating Mexico-U.S. migration.

This paper makes several contributions to the literature. First, I use a unique data set which is representative of undocumented and return migrants and allows for a common

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[2] 'Coyote' is the term for individuals that smuggle undocumented migrants across the U.S.-Mexico border.

framework in which to measure the influence that family networks, coyote prices, and sectoral income shocks have had on Mexico-U.S. migration since 1965. The approach is similar to that of Massey and Espinosa (1997), although with some important innovations. As in previous work, network effects operate through relatives with prior migration experience and are separated into father and sibling effects. However, the specifications are run controlling for individual fixed effects. I find that once shared tastes are controlled for, access to a father network does *not* significantly influence a son's probability of migrating. Sibling networks, however, have powerful effects on migration over and above what is explained by family correlation in migration propensity. On a first trip, access to an additional sibling network (a sibling who has prior migration experience) increases the annual probability of migrating from 1.9 to 4.8%. This represents a change of 154%! On repeat trips, own migration experience partly usurps the value of the network and the effect of the sibling network increases annual migration probability by only 12% (from 20.0 to 22.4%).

This work is also innovative in that I test for gender, aging and permanency effects of networks on migration. I find evidence of both gender and aging effects. Migrating sisters provide much less incentive than migrating brothers to a male sibling considering migration and similarly for aging networks. Recent networks are more powerful pull factors than older networks.

In addition, this is the first research to examine the effect of coyote prices on the incidence of migration[3]. Here I am concerned with the endogeneity of prices to demand for coyotes. I move to a two-stage least squares framework, using border enforcement hours as an instrument for coyote prices. I find that a $100 decrease in the coyote price leads to a 35% (21%) increase in the probability of migrating for the first (repeat) time. I am also concerned with endogeneity when measuring income and employment variation in the home state. Turning to an aggregate measure, I use agricultural sector GDP as a proxy for economic conditions in western Mexico. With this measure (and in the

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[3] Singer and Massey (1997) include coyote prices in a regression explaining modes of border crossing among undocumented immigrants.

Appendix, with an alternative price measure), I capture economic conditions at the origin without introducing variation that is endogenous to migration. I find evidence of the intuitive, counter-cyclical relationship between income and migration. The estimates indicate that a 10% drop in the per capita value of annual agricultural output increases the probability of migrating to the U.S. by 35% on a first trip and 10% on a subsequent trip.

II. THEORETICAL FRAMEWORK

(i). The Role of Networks

The earliest economic models of migration emphasize wage differentials as providing the impetus to mobility (Hicks 1932). In this sense, the work of Sjaastad (1962) is pivotal because it points out the importance of studying migration ***costs*** as well as migration benefits. Networks are clearly a cost-side determinant of migration, primarily because they channel information about the destination back to the origin community. Access to this information lowers the costs faced by subsequent migrants, implying that current migration soon becomes a function of past migration (Nelson 1959, Greenwood 1969, Taylor 1986, Carrington, Detragiache and Vishwanath 1996).

This view of networks is expanded upon in work by Douglas Massey and coauthors (Massey et al (1987) and Massey (1988)).[4] Massey breaks down the costs of migration into direct monetary costs, information and search costs, opportunity costs, and psychic costs. He demonstrates that access to migrant networks reduces costs in all four categories. In the case of Mexico, for example, access to a migrant network represents access to information about illicit border crossings and potential jobs and housing in the U.S. This information lowers monetary as well as psychic (by reducing uncertainty) moving costs, especially for a first-time migrant. With respect to border crossings, the migrant network has information about reliable coyotes, the access to which lowers the probability of apprehension and deportation by the U.S. Border Patrol and abandonment by the smuggler. Upon arrival, the network-provided information about jobs and housing shortens the job search and facilitates settlement, thereby lowering the search and

[4] As per the work of Coleman (1988), a network is a form of social capital. A network 'freely' provides information and assistance as the result of social obligations, social expectations, and social norms.

opportunity costs of the trip. Lastly, access to an established network may also entail access to short-term loans that help cover the costs of the trip, as well as present opportunities for cost sharing with regard to housing and other expenses.

The endogeneity of networks, as well as the lack of data available on networks, has made empirical work in this area difficult or hard to interpret. Networks in aggregated migration flows, defined for example as 'the previous stock of migrants', are difficult to interpret causally (Greenwood 1969). Networks at the household level can convey more clearly the potential migrant's behavioral response to the cost reductions that networks present (Massey and Espinosa 1997). However, in this regression scenario, coefficient estimates are likely biased for two reasons. First, tastes among family and friends are not uncorrelated; second, over time, network access is endogenous to own migration experience. One of the main contributions of this paper is to deal with these problems in the following way. First, individual fixed effects regressions remove the bias resulting from shared tastes for migration between the migrant and the network. Second, by dividing the analysis into first and subsequent trips, networks on first trips are temporally exogenous and should result in a lower bound estimate for the causal impact of network access in initial Mexico-U.S. migration.[5]

As seen above, networks operate in many different ways but most importantly through the transmission of information. This generates several testable hypotheses. First, the quality of information deteriorates with time; hence, aging networks should become less useful. The quality of information should improve with the permanence of the network, hence U.S.-based networks should be more valuable than migrant relatives who have already returned to Mexico. For male migrants seeking work, male-led networks should be more valuable than female-led networks since, on average, males have a tighter attachment to the labor market and are more likely to be in similar occupations. For the same reasons, although more as a result of the age difference between parents and children, parent-led networks should be less valuable than sibling networks.

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[5] If families plan their lifecycle migration strategies jointly in some initial planning period, then this measure is still endogenous.

(ii). The Role of the Regional Economy

Economists noticed early on that the standard wage theory of migration did not adequately explain rural-urban migration or international 'poor to rich' migration (Sjaastad 1962, Harris and Todaro 1970). Casual observation of the persistence of cross-country wage differentials or the acceleration of migration as wage gaps diminished, suggested that standard models did not capture the whole story of why migration occurs. More recent theory, such as the 'new economics of migration' (Stark and Bloom, 1985) explores alternative determinants. In dropping the assumptions of full information and complete markets, Stark and Levhari (1982) find that migration of individual household members can serve to diversify risk to family incomes in the sending regions. Stark and Yitzhaki (1988) and Stark and Taylor (1989) also develop a model of relative deprivation in which agents concerned with their relative social status migrate in order to improve their social ranking in the origin.

Whether the applicable theory is the 'new' or the 'old', we can expect economic downturns in the home region to have similar impacts on migration.[6] In standard wage theory, a reduced demand for labor exacerbates the Mexico-U.S. wage gap and unemployment differential. The higher expected wages in the U.S. result in increased migration, ceteris paribus. In the risk diversification scenario, a local economic downturn or region-specific negative income shock would stimulate migration through a decreased correlation with incomes in the destination (Taylor 1986). In the second case of relative deprivation, the shock will exacerbate the differences between migrants and non-migrants hence generating more migration.

The relation between economic conditions and Mexican migration has been documented in various studies at both the macro and micro level. Most authors have utilized wage

[6] A model of migration that can have a prediction inconsistent with standard wage theory is target income theory (Berg 1961, Byerlee 1974). If we assume the following things: incomplete capital markets, individuals migrate only to save and return with a predetermined amount of capital, and the need for capital is correlated with economic growth in the origin, then out-migration could be pro-cyclical with respect to economic conditions in the origin. See Lindstrom (1996).

measures to get at this relationship and have reached varied conclusions. A recent study by Hanson and Spilimbergo (1997) finds large effects of Mexican manufacturing wages on migration. Using border apprehensions data, they determine that a 10% increase in real Mexican wages lowers attempted illegal immigration by 6.4 to 8.6%. In contrast, in a study using the MMP data, Massey and Espinosa (1997) use worker characteristics to generate expected wages and find only a small effect of the predicted Mexico-U.S. wage gap on first-time migration, and no effect of wages on the probability of making additional trips. Lindstrom (1996) also uses MMP data and shows that migrants from relatively high-wage communities (defined as the percentage of workers earning more than twice the minimum wage) have longer spell duration in the U.S.

Discrepancies such as these probably arise from the use of different wage measures. In this paper, I use per capita agricultural sector output instead of wages to measure wage and employment fluctuations. An aggregate measure such as this allows me to address the effect of widespread changes in both income and employment. However, since fluctuation in output can also be seen as endogenous to migration through the effect on labor supply, I also present estimates utilizing the Banco de Mexico agricultural goods implicit price deflator (see appendix). Both of these measures avoid a host of problems associated with using realized wages when studying migration. First of all, time series of individual-specific realized wages are usually not available, and if they are available, they are endogenous to the migration decision and only reveal conditions in one locality at a given time. There is no time series of 'wages had individual i moved/not moved'. Constructing individual-specific *expected* wages may address some of these problems, but finding defensible instruments for wages (that can be excluded from the migration decision) is difficult. An aggregate wage series avoids this problem but, for Mexico, this time series is only available for the industrial sector, which is not applicable to most migrants. Therefore, to better capture economic conditions that are relevant for predominantly rural Mexicans, I utilize agricultural output and prices as proxies for the regional economic conditions but also control for national conditions by including Mexican GDP.

III. DATA, SAMPLE STATISTICS AND TRENDS

(i). The Data

This paper bases its analysis on the Mexican Migration Project (MMP) data collected by Jorge Durand and Douglas Massey between 1987-1995.[7] Source-country, individual-level data on international migrants have typically been very limited with surveys encompassing one or a few villages in which the populations are not randomly sampled and for whom no retrospective information is gathered. The MMP data, however, are based on surveys of approximately two hundred households in each of 35 communities in western Mexico. The data were gathered using random sampling methods within communities and contain basic socioeconomic and demographic information as well as retrospective life histories of a sample of household heads. In the life histories there is particular emphasis on individual and family migratory experience, work history, marriage and fertility behavior, and property ownership. This section gives some background on the data set and outlines the characteristics of the sample at the survey date as well as over time.

The surveyed communities are located in eight states (see Figure 1), five of which have remained predominantly rural: Michoacan, Nayarit, Zacatecas, Guerrero, and San Luis Potosi. In 1990, the primary sector is still the largest employer of men in these states, employing between 38 and 50% of all male workers.[8] Jalisco, Guanajuato, and Colima develop more diverse economies over the period under study, primarily through growth in the tertiary sector (commerce, transport, services, and government). By 1990, approximately one-quarter of working men in these three states are agricultural workers.[9]

The three most populous states in the data are Jalisco, Guanajuato, and Michoacan, and they have traditionally contributed the largest number of migrants to the United States (Dagodag 1975, Pimentel and Lopez-Vega 1992, Cornelius 1989).[10] The MMP data set

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[7] Jorge Durand and Douglas S. Massey, Population Studies Center, University of Pennsylvania
[8] Primary sector refers to activities in agriculture, animal husbandry, forestry, fishing and hunting.
[9] Source: XI Censo General de Poblacion y Vivienda, 1990
[10] Pimentel and Lopez Vega estimate that, in the 1970's, as many as one-half of all undocumented migrants were from Michoacan and Jalisco. By 1988, this proportion is believed to have fallen to below 20%.

is one of the few representative of the time-varying migration behavior of undocumented and return migrants from Mexico. One drawback of the MMP sample that I use is that it is only representative of 'stayers' and return migrants, not of Mexicans who permanently emigrate.[11]

(ii). The Sample

My sample consists of 5,478 male, Mexican-born household heads. In order to capture the behavior of likely labor force participants, only working-age men are selected. In each year, men aged above 65 or below 15 are dropped from the panel. Due to the age restriction, the panel is unbalanced with varying numbers of household heads giving information for each year. Taken together, the person-years add up to 116,420 observations. As shown in Table 1, household heads with any migrant experience make up 44 percent of the sample.[12] From the summary statistics, we can see that migrants are older and significantly less educated than non-migrants. Twice as many non-migrant heads attended high school and three times as many attended university. Migrant heads also average more children, 5.1 versus 4.3, are more likely to be employed in agriculture and to come from villages or small towns.

(iii) The Extent of Networks

Some of the most significant differences between migrants and non-migrants are with respect to the family migration histories. The network variables are constructed from the information available on other family members' migration experience. Following the discussion in the theoretical section, I devise measures of network access, age, and permanency. With regard to sibling networks, I also test for differences in brother versus sister-led networks. Access to a network is defined as having a relative that has U.S. migration experience, i.e. has made at least one trip to the U.S prior to the year 't'.[13] As

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Cornelius (1989, 1990) speculates that, by the late 1980's, the majority of Mexican migrants are no longer from rural areas.

[11] The MMP contains a U.S. sample I do not include. It was collected using 'snowball' sampling methods.

[12] Note that 470 (19%) of these migrants are inactive during the sample period (i.e., their last migration spell occurred before 1965). As compared with the active migrants, this group is older, less educated, has bigger families and is composed of more agricultural workers.

[13] Complete migration histories for family members are not available. The data only contain the year in which the family member (father, mother, sibling) makes his/her first and last U.S. trips and whether they eventually settle in the U.S. ('settle' means whether living in U.S. in the survey year).

seen in Table 2, in the survey year it is the case that migrants are *more than twice* as likely to have siblings and fathers who are migrants.[14] Almost two-thirds of migrants have sibling networks, compared to less than one-third of non-migrants. Of these sibling networks, one-third consist of at least one sister-led network. With respect to father networks, 29 percent of migrants have fathers who migrated, as compared to only 12 percent of non-migrants. The differences persist in the number of sibling networks migrants versus non-migrants have. Whereas migrants have 2.6 sibling networks on average, non-migrants with sibling networks average 1.8 networks. Non-migrants with sister networks also have slightly fewer as compared with migrants (1.4 versus 1.7).

Some of the above comparison, since it is taken at the time of the survey, is a reflection of time trends throughout the sample period. Doing the same comparison in 1970, we see the differences between migrants and non-migrants are even greater. Migrants are between 2.5 and 3 times more likely to have sibling and father networks.

There are also striking differences between migrants and non-migrants when we compare the age and permanency of their family networks. First, migrant heads have access to older networks (where age of network is measured in the survey year and is defined as the number of years since the family member's first U.S. trip). Sibling networks among migrants are older by an average of 7 years as compared to sibling networks among non-migrants (21 years compared to 14 years). At the time of survey, father networks are also older, averaging over 43 years for migrants and 40 years for non-migrants. Migrants also have access to more permanent networks. The measure of permanency is whether, by the end of the sample time frame, the family member in question resides in the U.S. Thirty-eight percent of migrants have a sibling living in the U.S. in the survey year, whereas only 17% of non-migrants do. For both migrants and non-migrants, about one-half of the established networks are composed of at least one sister-led network. Since sister

[14] I do not include mother networks in the analysis. 3.7% of heads have mother networks, 6% of migrants and 2% of non-migrants.

networks make up less than one-third of all networks, this last statistic suggests that female-led networks are more likely to be permanent than male-led networks.[15]

(iv). Levels of Migration Experience

The migrant experiences of household heads are detailed in Table 3 and are reported for all migrants and then separately for active migrants (those who migrate during the sample period).[16] Migration experiences are generally very diverse and, as a result, the median is a better summary statistic of the typical migration experience than the mean. Among all migrant heads, for example, the mean number of U.S. trips is five while the median is only three. Thirty percent of migrants have taken only one trip, another 30% have made two or three trips and overall, 72% of migrants have taken 5 or fewer trips. For the first U.S. spell, the median duration is six months. In fact, with respect to both first and last spells, over 90 percent of all spells last two years or less. The median of total U.S. experience is 24 months. Active migrants have slightly more trips (the mean is 5.5) of longer duration (median duration is 7 months). Thereby they also have, on average, 4 months more of U.S. experience as compared to the group of all migrants. Among active migrants, 83% migrate illegally on their first trip to the U.S., and 72% migrate illegally on their last U.S. trip. They overwhelmingly report migrating for reasons of work (98 %).

Table 4 reports more statistics on the sample of migration spells. Of the 8606 trips reported, 60.8 % are made illegally. Among these, 68% employ the help of a coyote and the average median coyote price paid is $519 (1994 dollars). Twenty percent of trips are made with green cards, 9.6% with agricultural worker permits, and 6.3% with tourist visas.[17] The amnesty category refers to the provisions of the Immigration Reform and Control Act (IRCA), which was passed in 1986 with amnesty provisions for farmworkers

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[15] Female migrants are probably more likely to be accompanying spouses to the U.S. and from other research we know that joint migration is more permanent than migration by either unmarried men or married men that leave their families in Mexico (Paulson & Singer, 1998).

[16] The summary statistics in Table 3 are taken with respect to each migrant's lifetime, this implies that some of the reported spells actually fall outside the sample period of 1965-1994.

[17] In Table3 and 4, the tourist crossings are counted as illegal crossings if the migrant reports working on the trip.

and illegals in 'permanent' residence since 1982.[18] From the data on U.S. destinations, we see that 55.6 % of spell years are spent in California, 16.8 % in Texas, with the next three top destinations being Florida, Idaho and Illinois.

(v). Trends in the Data

By simply plotting the raw data over time, this section of the paper demonstrates how clearly the benefits and costs of Mexico-U.S. migration have changed since the 1960's. As stated in the Introduction, migrant inflows from Mexico are believed to have been increasing since the end of the Bracero program in 1964. Figure 2 is consistent with this view and shows annual migration propensity in the data increasing from a low of 3.8 in 1965 to a high of 11.4 in 1994, the average migration rate being 7.4%. In light of this upward trend, developments on the cost side of the migration equation in both networks and coyote prices are very instructive. Figure 3 shows how family migrant networks have expanded over time. The steepest increase is in sibling networks, which trend from a low of 20% in 1965 to a high of 47.5% in 1994. The number of sibling networks also more than doubles over this time period, as shown in the lower graph in Figure 3. The variation in the tail of the series reflects the declining sample size after 1987, the first survey year. In Figure 4, coyote prices show an equally steep trend, decreasing from $940 to $300 (1994 dollars) over the sample period.[19] The coyote price time series is constructed from the prices (in dollars) as reported by undocumented migrants utilizing coyotes. To minimize the influence of outliers, I take the median reported coyote price in each year and deflate it using the U.S. CPI. The long-term decline is striking and appears to be a phenomena uncorrelated with border vigilance, which has been increasing throughout this period.[20] Figures 5 and 6 depict annual averages of monthly border enforcement (linewatch) hours and the number of apprehensions per enforcement hour.

[18] Over two million Mexicans obtained legal status through IRCA.
[19] The coyote prices reported in the data do not control for type or extent of coyote services. The decline in prices paid for coyotes may partly reflect an increase in the number of migrants who use coyotes only for the actual border crossing and not for the entire trip from the hometown to the final destination. See Orrenius 1999 for more on this.
[20] Cornelius (1989) has coyote price data which shows similar levels and patterns for the 1980's.

Although coyote prices are generally falling and enforcement hours are increasing, a regression specification that controls for the implementation of IRCA and a linear trend generates a positive and significant effect of higher border enforcement hours on coyote prices. This is evidence that enforcement hours partly explain short-run variation in coyote prices. Because I am concerned about the endogeneity of coyote prices to migration, this relationship between border enforcement hours and coyote prices implies that enforcement hours are a good candidate for a coyote price instrument. The main point of this discussion, however, is that Figures 3 and 4 taken together show how the two components of moving costs, network access and coyote prices, have made Mexico-U.S. migration 'cheaper' in each year since 1965.

The variation in the migration rate also appears consistent with changing economic conditions in the region of study. Given the largely rural nature of these western Mexican states, a measure of regional economic conditions that is exogenous to local migration is the agricultural component of Mexican GDP (as is the agricultural implicit price index used in the Appendix).[21,22] In Figure 7, the migration rate is plotted against per capita agricultural output, and the correlation is clear. The long-run decline in the agricultural sector underlies the upward trend in migration rates during the sample period. The relationship is quite sensitive to year-to-year changes as well. The recovery in the rural sector in the late 1970's and early 1980's is matched by a slow-down in migration. The late 1980's migration surge corresponds very closely to the precipitous fall in the value of agricultural output in 1987.

The decline in the Mexican agricultural sector is well documented. Jesus Reyes Heroles (1983), Heath (1988) and Martin (1993) date the long-run decline in Mexican agricultural

[21] The 'sector agropecuario' includes agriculture (~60%), animal husbandry (~32%), forestry (~5%) and hunting and fishing (~3%). In 1965, this sector comprises 13.6 % of GDP. This proportion falls to around 8% by 1990. Partly responsible for the precipitous fall in output beginning 1985 is a halving of public investment in rural development between 1980-1988, similar cutbacks in rural credit/lending, and a fall in world prices.

[22] It is important to utilize an exogenous measure of local economic conditions, otherwise the change in conditions will simply mirror the change in migration when local migration rates are large.

productivity beginning in the 1960's.[23] In his work on income inequality, Jesus Reyes Heroles points out how this decline has contributed to a worsening of living standards for the bottom-decile families in the income distribution, a phenomenon which is otherwise difficult to explain using aggregate economy measures such as national GDP.[24]

IV. EMPIRICAL FRAMEWORK

The effect of migrant networks, coyote prices, and economic conditions on migration is first estimated using a linear probability model.[25] Due to the endogeneity of coyote prices, I then run a two-stage least squares estimation in which I instrument for coyote prices using border enforcement hours.[26] Enforcement (linewatch) hours reflect the intensity with which the border is patrolled, a factor which in turn influences coyote prices through its effect on the probability of apprehension and deportation. In the last section, I estimate the effect of network characteristics on migration using an individual fixed effects regression.

Each of these regressions is run fully interacted for first trips and subsequent trips. One motivation for stratifying the data in this way is to not constrain first-time migrants to respond as experienced migrants do with regard to changes in networks, coyote prices and economic conditions. First-time migrants have not yet established networks outside the family, so their response to a change in family networks should be distinct from that of an experienced migrant with own border-crossing experience and other 'connections'. First-time migrants also have less wealth and are less likely to be married and have children. All these factors imply their responsiveness to changes in migration determinants may be different.[27]

[23] The reference here is with respect to traditional agriculture (Heroles, 1983).
[24] Heroles points out that the incomes of poor rural households do not covary with the business cycle (p. 341).
[25] I elected to stay within a linear framework since estimation by a logit model yields very similar estimates.
[26] I thank Gordon Hanson for kindly providing me with these data.
[27] One drawback of this approach is that if the subgroup of migrants is very different from the rest of the sample, then the results for higher-order trips could be driven by sample selection and not a true relationship between the regressors and the incidence of migration. I have partly addressed this question however by rerunning the first-trip regressions on just the migrant sample. I find that the results are very close to the estimates generated for the unrestricted sample.

In the baseline specification, migration is estimated as a linear function of the following variables (where FIRST and REPEAT are indicator variables taking on the value '1' if the migrant is at risk for a first or repeat trip and '0' otherwise)[28]

$$Y=FIRST*X\beta + REPEAT*[X\delta + Z\phi] + \varepsilon$$

Where $X\beta$ corresponds to the following sum (similarly for $X\delta$):

$$\beta'X=\beta_0+ \beta_1(\text{father network})_{it} + \beta_2(\text{\#sibling networks})_{it} + \beta_3(\text{\#sister networks})_{it}$$
$$+ \beta_4(\text{coyote price})_t + \beta_5(\ln AGR_{mex})_t+ \beta_6(\ln GDP_{mex})_t + \beta_7(unem_{US})_t + \beta_8(\ln GDP_{US})_t$$
$$+ \beta_9(IRCA)_t+ \beta_{10}(ImmAct90)_t + \beta_{11}(time)_t + \beta_{12}(urban)_i + \beta_{13}(age)_{it} + \beta_{14}(educ)_i$$

and

$$\phi'Z=\phi_0(\text{\#US trips})_{it} + \phi_1(\text{\#months US experience})_{it} + \phi_2(\text{years since last US trip})_{it}.$$

The dependent variable is a binary variable taking on the value '1' if the household head makes a U.S. trip in year t and '0' otherwise. The network numbers and coyote prices control for moving costs, or the change in the *costs* of migrating. Own migration experience is also a cost measure, but since I am using it here strictly as a control variable I will not elaborate on its direct impact in any detail.[29] The agricultural measure is the log of the value of per capita agricultural output. It measures change in the *benefits* of migrating. A positive income shock implies a higher value of agricultural output and is hypothesized to lower the propensity to migrate, as are higher costs in the form of increased coyote prices or the absence of networks. Aggregate economic output is included to control for conditions in the national economy, conditions that are likely to affect the households in cities as well as any relatively high-skilled household heads (since they are less likely to be participating in the agricultural sector).

[28]Estimation is based on the assumption that the regression disturbances ε_{it} obey classical properties of zero mean, serial independence and no correlation with the covariates. Robust, clustered (on hh id) standard errors are utilized.

[29] Outside of the individual fixed effects specification, excluding own migration experience upward biases the coefficient on networks for repeat migrants. Other statistically significant variables are also affected, including the coefficients on the urban dummy and the age and education covariates. The omitted variable bias must be balanced against the problems inherent with including a lagged dependent variable. The coefficients on own migration experience are biased for finite T (Hsiao 1993).

Other migration pull factors, i.e. economic conditions in the U.S., are controlled for with a weighted average of state unemployment rates and also with the log of per capita U.S. GDP.[30] The unemployment rate is thought of as a good proxy for job search costs, especially for low-skilled workers, and is part of the 'expected wage' equation (Todaro 1969). Changes in U.S. immigration policy are controlled for with a dummy variable for the years following the passage of IRCA in 1986, as well as with a similar indicator for the years following the implementation of the Immigration Act of 1990. A linear time effect is added to capture any general trend and an urban dummy is included to capture level differences in migration propensities by level of urbanicity. Lastly, age and education regressors are included as a group of indicator variables relaxing the restriction of a linear age and human capital effect with respect to y_{it}.[31] In the section on network characteristics, network age and permanency are added to this set of regressors.

V. FINDINGS

The results presented below show that among the cost and benefit measures, first-time migration is most influenced by the development of sibling migrant networks. This result is robust to the inclusion of individual fixed effects. Coyote prices and regional economic conditions have also played significant roles as migration determinants. On repeat trips, they have coefficients similar to the sibling network effects. The estimation results suggest that falling coyote prices have significantly increased the probability of migration as have periods of declining conditions in the Mexican agricultural sector. Interestingly, rural output levels have significant explanatory power for both new and experienced migrants, whereas national economic output impacts neither group.

(i). The Effect of Migrant Networks

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[30] The U.S. states included in this measure are California, Texas, Florida, Illinois and Nevada. The weights are the percentage of migrants going to a specific state, hence they are community-specific and time invariant.

[31] The MMP data include a multitude of other pertinent individual-specific information such as legal status, occupation, marital status, number of children, and property ownership. In a panel (lifecycle) setting, however, it is difficult to argue that these variables are exogenous to migratory choices, hence they are not included.

As Table 5 shows, migrant networks provide powerful incentives to migration. As one would expect though, the effects of networks depend on the migrant's own level of experience. Whereas for first trips the effects of networks are very large, they are much less important to migrants on repeat trips. On first trips, before controlling for individual fixed effects, access to a father network increases the annual probability of migration by 81% (the coefficient 0.0149 represents an 81% increase in the probability of migrating—raising it from 1.9% to 3.4%). Access to an additional sibling network has a similar effect, increasing the probability of migration by 85%.[32] For repeat trips, the respective estimates imply changes of 7% for father networks and 3% for sibling networks, although the estimate for father networks is not statistically significant. The diminished impact of family networks on repeat trips not only reflects the substitution of own migration experience for that of the network, but also the fact that experienced migrants acquire new non-family networks which are not measured in the survey.

Interestingly, there is one set of networks which is significant on both repeat and first-time trips but with opposite signs. An additional sister network provides an effect over and above the sibling effect for experienced migrants, resulting in a 10% increase in the probability of migrating. On a first trip, however, this same additional sister network causes a 43% decline in the probability of migrating. Once individual effects are controlled for, we see that the 'true' gender effect is similar to the one on first trips—it is negative as suggested in the theoretical section.

(ii). The Effect of Coyote Prices and the Regional Economy

Coyote prices have the expected negative and significant effect on migration, with a largely similar impact on first trips as compared with repeat trips. On a first trip, a $100 increase in the median coyote price leads to a 21% decrease in the probability of migrating. For repeat migrants, the effect is a 13% decline. In Table 6, once I instrument

[32] Access to any sibling network (i.e., one or more) is also a relevant measure. When a dummy variable is used to indicate this (taking the value '1' if the individual has a sibling with prior migration experience and '0' otherwise), then network effects are even larger. Access to a sibling network increases migration probability by 135 % (198% with individual fixed effects) on a first trip and by 0% (32% with IFE) on a repeat trip.

for coyote prices, the magnitude of these effects increases to 35% and 21% respectively. Given that median coyote prices declined about $650 in real terms over the 30-year period under study, the point estimates suggest that this trend has led to an average annual increase in migration probability of 4-7%.

Turning next to the impact of economic conditions, the results from Table 5 suggest the effect of a ten percent decrease in the value of per capita agricultural output is a 43% increase in the probability of making a first-time trip to the U.S. Given that the annual average probability of making a first-time trip is 1.9 %, worsened economic conditions would increase the migration rate to 2.7%. Repeat migrants are less sensitive to economic conditions and respond to the same 'negative income shock' with a 13% increase in the probability of migrating, an effect which increases their average migration propensity from 20% to 22.7%. In neither case do these findings support the type of target-saving model in which migration varies positively with economic conditions in the origin. First-time migrants may be responding more readily to changing economic conditions because they have less insurance against income volatility. On average, first trips occur when individuals are younger, have less job security, lower levels of wealth and savings, and little access to capital markets. Note that when running the instrumented regression in Table 6, these estimates become slightly smaller. The response to a 10% drop in rural output is a 35% and 10% increase in the migration probability of first and repeat migrants respectively. Interestingly, national conditions do not appear to impact migrants on first or higher-order trips since ln(GDP/pop) is not statistically significant in the instrumented regression.

(iii). The Role of the U.S. Economy, IRCA and Demographic Variables

With respect to U.S. economic conditions, the unemployment variables appear to be capturing the effect of the U.S. economy on migration out of this region of Mexico. Considering the instrumented regression in Table 6, a one percentage point increase in the unemployment rate (roughly a 12% change) reduces the probability of undertaking a trip by 0.0012 and 0.0063 (6% and 3%) for first-timers and repeat migrants respectively.[33] Notice that, once the unemployment rate is controlled for, the effect of U.S. GDP is of the correct sign but not statistically significant in either sample.

The policy variables in Table 6 demonstrate that IRCA successfully reduced the propensity for first-time migration (by 35%) but had no significant effect on deterring repeat migration. In fact a large portion of the active migrants in the data were legalized under IRCA, promoting further migration. These findings are in line with the conclusions of other work such as Woodrow and Passel (1990), Donato, Durand and Massey (1992) and Espenshade (1994). In contrast, the Immigration Act of 1990 has had no noticeable impact on first-time migration but has increased the annual probability of repeat migration by 28%. Since the Immigration Act of 1990 affected mostly the rights of legal (permanent resident) immigrants, it is unclear why the policy should have this effect on migration.[34] Hanson and Spilimbergo (1997) have the same finding in their paper, and conclude that the control variable is simply picking up the depreciating impact of IRCA.

As for demographic variables, the age and education effects have the expected signs and most are highly statistically significant. The gains to migration are thought to be larger for younger migrants (Becker 1964) and the empirical results support this. Among first-time migrants, 19-24 year olds are most likely to migrate, followed by 15-18 year olds and those aged 25-30. For repeat migrants, the estimates are monotonic in age with migratory frequency decreasing in each age category. Education effects are similarly consistent with what theory predicts. Generally, since Mexico is relatively plentiful in low-skilled labor as compared with the U.S., this should result in the migration of the less-educated (Borjas 1985, 1987). The results indicate that although the least-educated

[33] This estimate is in line with estimates by Acevedo and Espenshade (1992) although they utilize the ratio of Mexican and U.S. unemployment rates and study its effect on aggregate migration.

[34] This Act placed a numerical cap on total legal immigration to the U.S. It also expanded employment-based immigration and made 10,000 permanent residency green cards available to foreign investors each year.

(the no schooling group) are not the most likely to migrate, the groups with 2-4 or 5-6 years of schooling do have the largest migration probability, all things the same.[35]

(iv). Networks and Network Characteristics with Individual Fixed Effects

The theoretical section discussed the need to include controls for correlated tastes for migration among family members when measuring the impact of migrant networks. The results from the individual fixed effects regressions are presented in Tables 7 and 8. Before adding extended network characteristics, note that once individual fixed effects are controlled for (Table 7, columns 2 and 4), the coefficients on father and sibling networks change to 0.0105 (a decrease) and 0.0285 (an increase) respectively on first trips. On repeat trips the estimates both rise when individual effects are added, the coefficients are 0.0218 and 0.0248.

On first trips the father network loses statistical significance when individual fixed effects are added, suggesting the relation between father and son migration is not necessarily causal but rather a statistical correlate due to shared tastes for migration. The sibling network estimates however are statistically significant and represent increases in the probability of migrating of 154% on first trips and 12% on repeat trips. Having a sibling with U.S. migration experience increases the average annual probability of first-time migration from 1.9% to 4.8%. These results are consistent with the hypothesis that sibling network effects should be larger than those of father networks since siblings provide more relevant job market information. Moreover, we should expect that the effect on inexperienced migrants be larger than that on migrants with own migration-specific human capital and 'new' networks. The gender effect is also negative as the theoretical section predicted. Although it is not statistically significant on higher-order trips, an additional sister network represents a halving of the sibling network effect on first-time migration probability.

[35] This suggests there may be some threshold wealth or skill level necessary to undertake the trip or hold a U.S. job.

When including controls for network aging and permanency and after adding individual-level fixed effects (Table 8), the magnitude and significance of the sibling network effect remains. Notice however that including fixed effects wipes out several of the network characteristics that enter significantly in the absence of these individual-level controls—namely, father networks and the permanency measure. This is also true on repeat trips. In fact, when characteristics of networks are controlled for separately, the individual-fixed effects regression on repeat trips yields statistically significant network and aging effects. On first trips, the network and gender effects are robust to the full specification.

Aging networks have the expected negative effect on probability of migration, significant on both first and repeat trips before adding fixed effects and statistically significant on repeat trips after adding fixed effects. It seems that aging networks do not predict the timing of a first trip once we control for migratory inclination. On a repeat trip, for each year that a network ages, the probability of migration is reduced by 1%. Since 'time between trips' is included as a control variable, the aging covariate potentially reflects the deterioration in the quality of information the network can provide as it ages.

Summing up, the findings in this section indicate that the largest cost advantages to first-time migration come from access to sibling networks. The effect of father networks on son's migration seems largely driven by a correlation in tastes for migration. Permanency measures likewise do not survive the introduction of individual fixed effects. There is evidence however that both female-led (sister) networks and aging networks provide progressively fewer cost advantages to migrants. On first trips, once tastes are controlled for, an additional sister network reduces the probability of migrating by 131% and for each year that a network ages, the probability of undertaking a repeat trip falls modestly by 1%.

VI. CONCLUSION

This paper uses unique, source-country data merged with various macroeconomic indicators to examine three sources of change in Mexico-U.S. migration since the 1960's. The effects of family networks, coyote prices and economic conditions are studied in a common framework. This research makes contributions in several areas; first, by deriving the effects of family migrant networks after controlling for family-wide correlation in tastes for migration; second, by addressing the endogeneity of coyote prices in a two-stage least squares estimation with border enforcement hours as an instrument; and third, through the use of measures of sectoral economic conditions that are exogenous to migration. I also develop measures of network characteristics and estimate how aging networks depreciate, how gender networks play a role, and how large an impetus to migration is provided by permanent networks. The results are largely consistent with the predictions outlined in the theory section. As each set of findings has its own implications, I draw the conclusions separately.

Using 30 years of individual-level data on migration histories, I find that access to family migrant networks is the single most important migration determinant for first-time migrants. Sibling networks have the largest effect, increasing the annual probability of a first trip by over 150%. On repeat trips, own experience replaces the usefulness of the network and although sibling networks still have a positive and significant effect, it is small in comparison (representing only a 12% change in the annual probability of migrating). Another possibility is that migrants come to depend on new, out-of-family networks once they have been in the U.S. The greater significance of networks is that short-run push factors and scant migration can translate into large migration flows in the long run (Massey et al 1987, Massey 1988). This point has often been made with regard to U.S. immigration policy since the natural cost advantage of migrants with U.S. networks are reinforced by the family reunification emphasis in visa allotments. In the context of networks, these kinship provisions imply a fast-growing legal immigrant population with a similar skill and geographic distribution to the existing more recent immigrant population.

The other cost component studied here, namely smuggling fees a.k.a. coyote prices, has also had a significant positive effect on migration. The results clearly show migrants are both consumers of coyote services and price-sensitive, hence the falling real price of coyote services through 1994 has contributed to increasing illegal migration from

Mexico. This finding implies that intensified border enforcement can have a deterrent effect on migration if it is implemented successfully, i.e., if it succeeds in increasing the probability of apprehension of both migrants *and* coyotes. Presumably the increase in the probability of apprehension should raise coyote prices or alternatively lower the quality of services they provide. When linewatch hours are increased but apprehension probabilities do not rise correspondingly, as was the case following the passage of IRCA (see Figure 6), coyote prices will not respond.

Last but not least, my findings suggest sectoral economic conditions have a significant impact on male migration behavior. Economic downturns in the rural sector, such as those representing a 10% drop in per capita agricultural output, increase annual migration propensities by 35% on first trips and 10% on subsequent trips. The fact that national GDP shocks do not impact the migration behavior of new migrants in rural areas highlights the importance of focusing on regional economies when studying migration and when devising domestic and foreign policy. This finding also suggests that the deep Mexican crisis of the 1980's was not a significant migration impetus for rural Mexicans. It may have served rather to draw large numbers of urban dwellers into Mexico-U.S. migration for the first time, as Cornelius has suggested in his work (1989).

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Figure 1: Map of Mexico with Surveyed States as Indicated

Figure 2: The Evolution of the Migration Rate 1965-1994

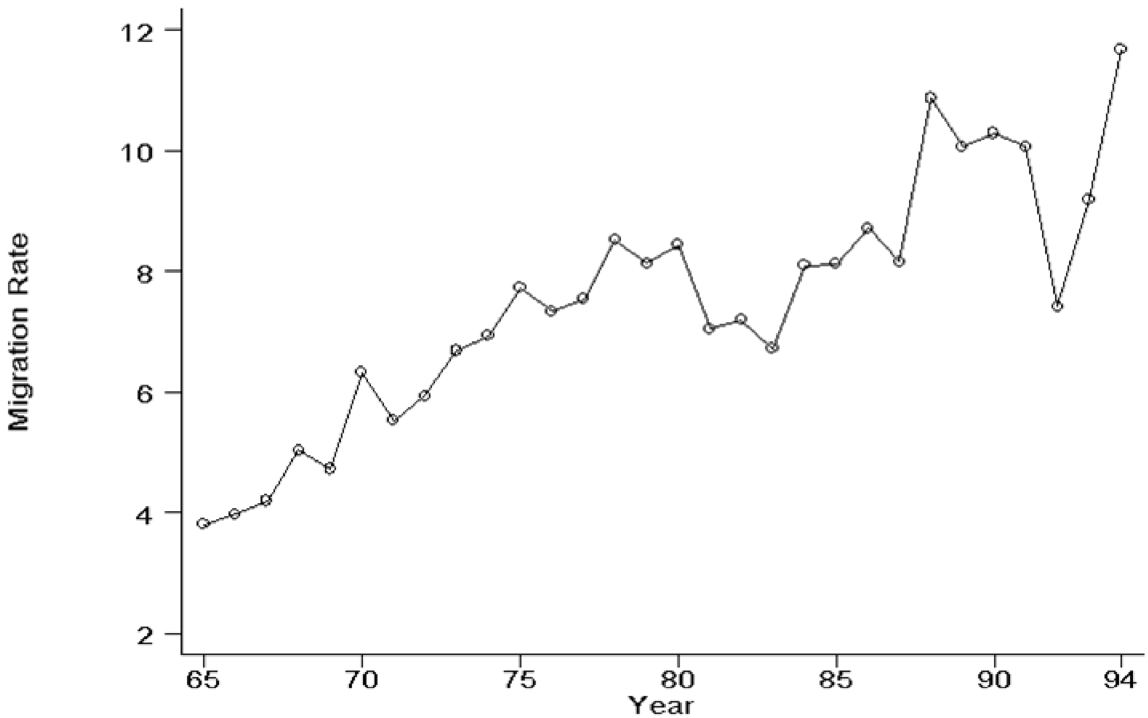
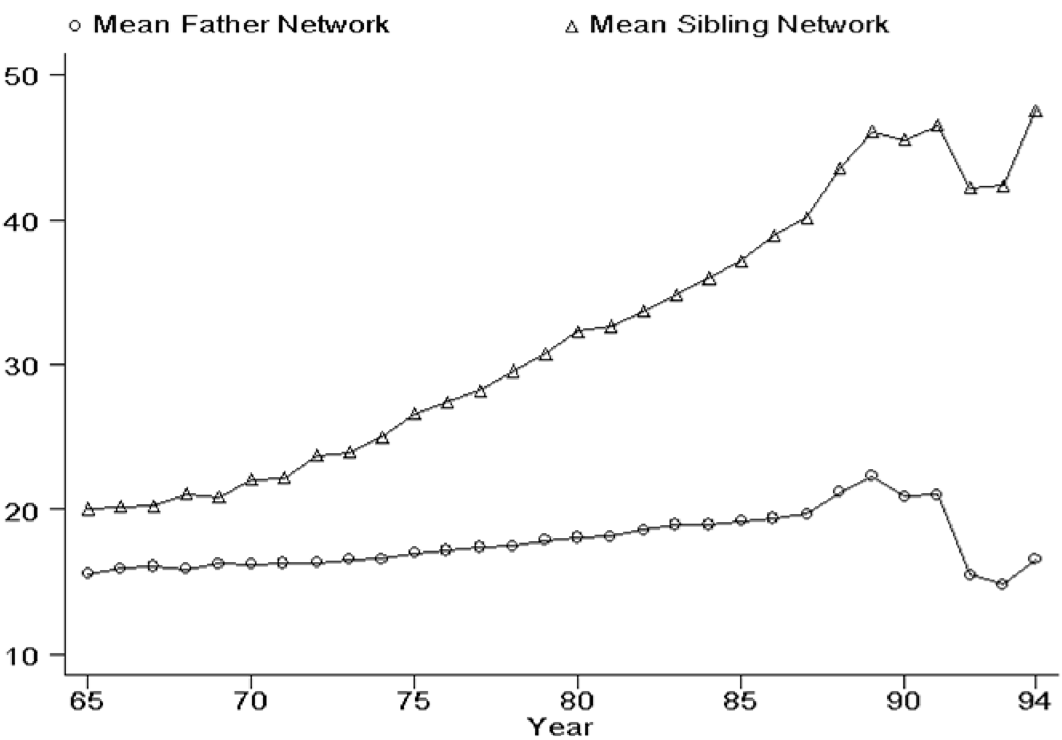


Figure 3: The Evolution of Father and Sibling Networks 1965-1994



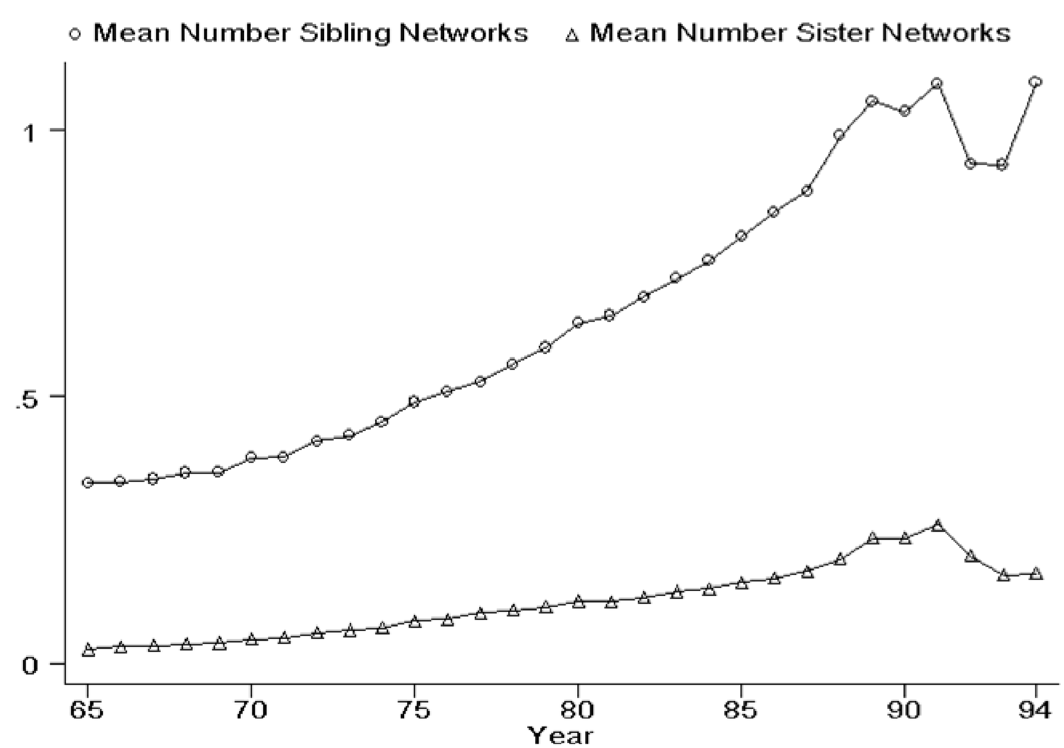


Figure 4: Median Annual Coyote Price 1965-1994

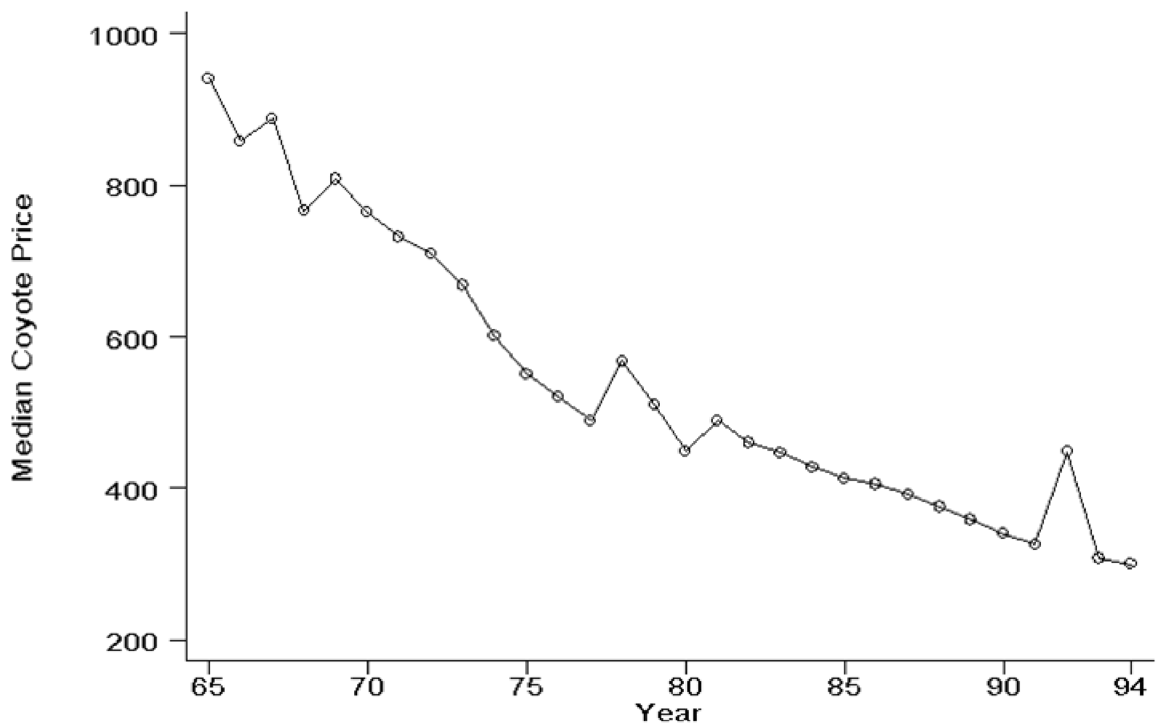


Figure 5: Annual Enforcement Hours in Thousands 1965-1994

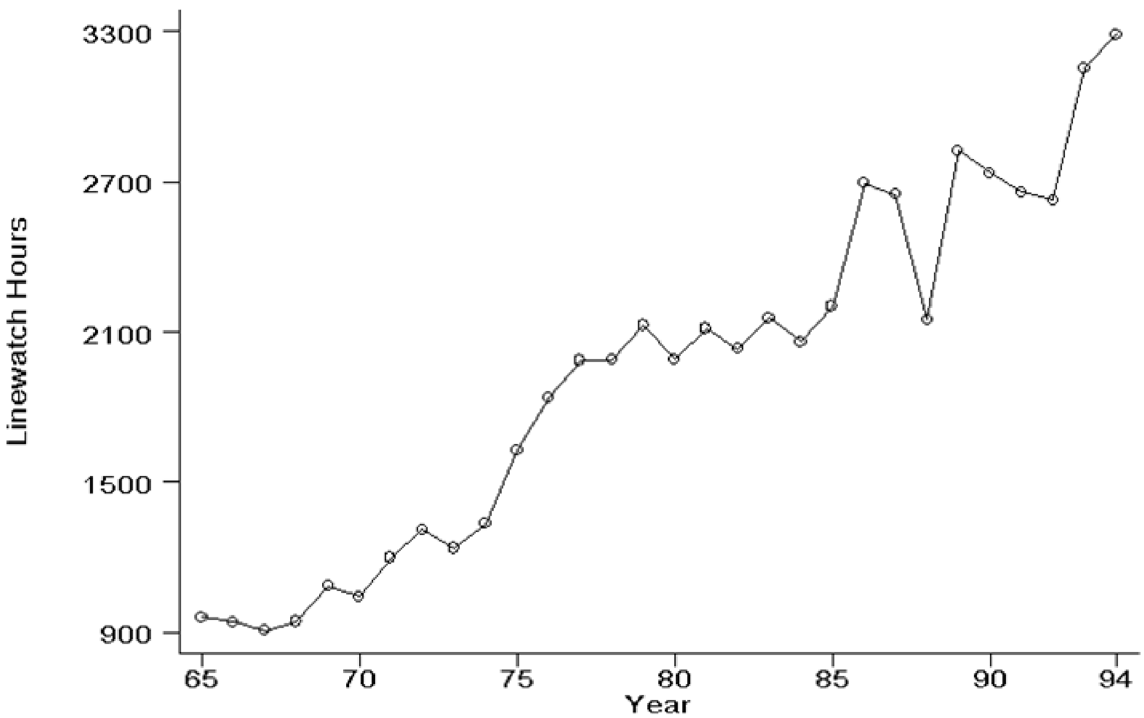


Figure 6: Apprehensions per Enforcement Hour 1965-1994

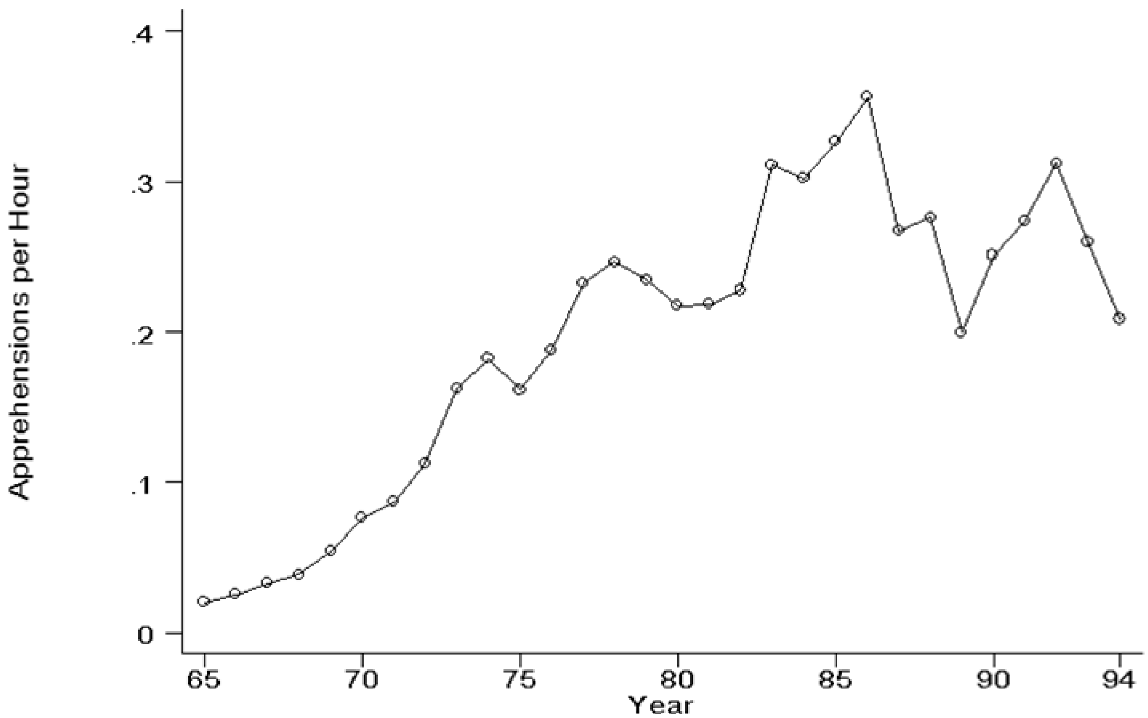


Figure 7: The Migration Rate Vs. Per Capita Agricultural Output

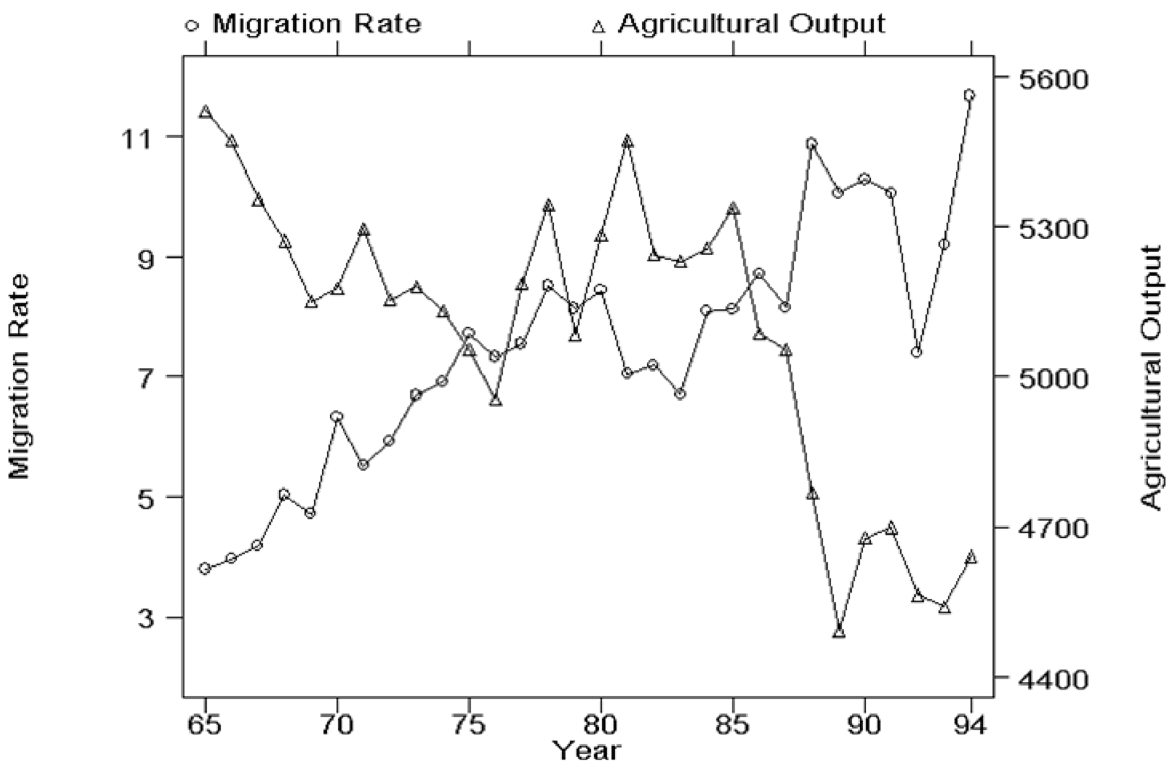


Table 1: Sample Characteristics

Summary Statistics (Standard Deviations) by Migrant Status in Survey Year

	MIGRANT	NON MIGRANT
# of Household Heads	2418	3060
Median Age	46.0 (15.5)	43.0 (15.4)
SCHOOLING		
Median Years of Schooling	3.0 (3.9)	6.0 (5.1)
% No Schooling (0-1)	27.1	23.3
% Some Schooling (2-4)	32.6	22.1
% Primary (5-6)	23.1	22.5
% Secondary (7-9)	8.9	11.7
% Preparatory (10-12)	4.3	8.1
% University (>=13)	4.1	12.3
FAMILY		
% Married	90.9	91.7
# of Children	5.1 (3.3)	4.3 (3.2)
OCCUPATIONAL CATEGORY (%)		
Agriculture	38.8	22.4
Manual Labor—Skilled	15.1	19.4
Manual Labor—Unskilled	10.9	9.8
Sales	12.0	13.6
Service	7.8	10.9
Professional	3.5	10.1
Other	11.9	13.6
CHARACTERISTICS OF ORIGIN (%)		
Village (pop<3000)	27.6	14.3
Small Town (3000<pop<15000)	33.7	22.5
Town (15000<pop<60000)	27.8	28.8
City	10.9	34.3

Table 2: Prevalence and Characteristics of Family Migrant Networks In Survey Year (unless noted otherwise)

	MIGRANTS	NON-MIGRANTS
% Self Migrant Prior to 1965	35.9	0
% With Access to:		
Sibling Network	62.2	30.0
Sister Network	18.5	8.7
Father Network	28.9	12.2
% With Access to (in 1970):		
Sibling Network	35.5	11.8
Sister Network	5.7	1.9
Father Network	24.8	9.6
Number of Networks (conditional >0)		
# Sibling Networks	2.6	1.8
# Sister Networks	1.7	1.4
Age (in years) of Initial Network:		
Median Age of Sibling Network	24	17
Median Age of Father Network	43	40
% With Permanent Networks:		
Sibling residing in U.S.	37.8	16.9
Sister residing in U.S.	15.1	7.3
Father residing in U.S.	2.4	0.9

Table 3: Migration Experience at Survey Date by Active Migrant Status

Medians reported unless otherwise indicated (standard deviations)

	ALL	ACTIVE
# Household Heads	2418	1928
Number of US Trips	3.0 (6.2)	3.0 (6.7)
Duration of 1st trip (months)	6.0 (37.6)	7.0 (31.7)
Duration of last trip (months)	6.0 (44.0)	7.0 (35.4)
Total US Experience (months)	24.0 (79.3)	28.0 (78.4)
% Migrate legally: 1st	27.1	17.2
% Migrate legally: Last	36.5	28.3
% Worked on 1st trip	98.4	98.3
% Worked on last trip	97.7	97.5

Table 4: Summary of Documentation & Destination On U.S. Trips Undertaken During Sample Period

Total Number of Trips	8606
# Trips w/reported documentation	8561
# Trips w/reported crossing mode	8050
Documentation:	
% Undocumented	60.8
% Documented (Green Card)	20.3
% Agricultural Worker Permit	9.6
% Tourist	6.3
% IRCA Amnesty	2.7
% Citizen	0.3
Coyote Utilization:	
% Coyote Assisted	68.1
Mean coyote price (1994 $)	519
Destination:	
% California	55.6
% Texas	16.8
% Florida	6.7
% Idaho	6.2
% Illinois	3.9
% Other	10.8

Table 5
Determinants of Mexico-U.S. Migration on First and Repeat Trips
Method of Estimation: Linear Probability Model with Robust Standard Errors
Standard Errors in Parentheses

	First Trip	Repeat Trips
Migration Cost Measures		
Father Network Indicator	0.0149 **	0.0131
	(0.0021)	(0.0101)
# of Sibling Networks	0.0157 **	0.0058 *
	(0.0015)	(0.0036)
# of Sister Networks	-0.0080 **	0.0136 *
	(0.0030)	(0.0083)
Median coyote price ($100s)	-0.0038 **	-0.0260 **
	(0.0015)	(0.0060)
Migration Benefit Measures		
Mexican Economic Conditions		
Ln(AgricGDP/Pop)	-0.0796 **	-0.2627 **
	(0.0188)	(0.0611)
Ln(GDP/Pop)	0.0228 **	0.0213
	(0.0115)	(0.0409)
U.S. Economic Conditions		
Unemployment rate (wghtd avg)	-0.0008	-0.0044
	(0.0006)	(0.0032)
Ln(GDP/pop)	0.0486	0.1723
	(0.0306)	(0.1338)
U.S. Immigration Policy		
IRCA	-0.0071 **	-0.0082
	(0.0029)	(0.0089)
Immigration Act of 1990	-0.0002	0.0413 **
	(0.0032)	(0.0139)
Education Indicators (‘no schooling’ is omitted category)		
Some Schooling (2-4 years)	0.0031 **	0.0143
	(0.0014)	(0.0101)
Primary School (5-6 years)	0.0022	-0.0051
	(0.0015)	(0.0126)
Secondary School (7-9 years)	-0.0023	-0.0113
	(0.0019)	(0.0192)
Preparatory School (10-12 yrs)	-0.0092 **	-0.0379 *
	(0.0020)	(0.0229)
University (>12 years)	-0.0140 **	-0.1066 **
	(0.0018)	(0.0190)
Age Indicators (‘age 37-42’ is omitted category)		
Age 15-18	0.0154 **	0.2797 **
	(0.0021)	(0.0420)

Table 5 Continued

Age 19-24	0.0238 **	0.1769 **
	(0.0019)	(0.0180)
Age 25-30	0.0111 **	0.0745 **
	(0.0017)	(0.0123)
Age 31-36	0.0030 *	0.0340 **
	(0.0016)	(0.0085)
Age 43-48	-0.0041 **	-0.0298 **
	(0.0015)	(0.0076)
Age 49-54	-0.0072 **	-0.0445 **
	(0.0015)	(0.0103)
Age 55-60	-0.0101 **	-0.0393 **
	(0.0015)	(0.0124)
Age 61-65	-0.0094 **	-0.0454 **
	(0.0019)	(0.0154)
Time	-0.0016 **	-0.0072 **
	(0.0006)	(0.0029)
Urban	-0.0117 **	-0.0260 **
	(0.0009)	(0.0123)
Own Migration Experience		
Number of US trips		0.0224 **
		(0.0016)
US experience (mo's)		0.0008 **
		(0.0001)
Years Between US Trips		-0.0104 **
		(0.0006)
Number of Individuals in pooled regrsn	5474	
Number of Individuals*Years	116420	
R Squared	0.33	

Note: ** and * superscripts indicate statistical significance at 5 and 10% significance levels respectively.

Table 6
Determinants of Mexico-U.S. Migration on First and Repeat Trips
Method of Estimation: Two-Stage Least Squares with Robust Standard Errors
Standard Errors in Parentheses

Variable	First Trip	Repeat Trips
Migration Cost Measures		
Father Network Indicator	0.0149 **	0.0132
	(0.0021)	(0.0101)
# of Sibling Networks	0.0157 **	0.0058 *
	(0.0015)	(0.0036)
# of Sister Networks	-0.0080 **	0.0137 *
	(0.0030)	(0.0083)
Median coyote price ($100s)	-0.0065 **	-0.0413 **
	(0.0027)	(0.0106)
Migration Benefit Measures		
Mexican Economic Conditions		
Ln(AgricGDP/Pop)	-0.0640 **	-0.1902 **
	(0.0227)	(0.0706)
Ln(GDP/Pop)	0.0128	-0.0312
	(0.0136)	(0.0462)
U.S. Economic Conditions		
Unemployment rate (wghtd avg)	-0.0012 *	-0.0063 *
	(0.0007)	(0.0035)
Ln(GDP/pop)	0.0329	0.0895
	(0.0322)	(0.1418)
U.S. Immigration Policy		
IRCA	-0.0064 **	-0.0047
	(0.0030)	(0.0089)
Immigration Act of 1990	0.0026	0.0550 **
	(0.0040)	(0.0162)
Time	-0.0017 **	-0.0078 **
	(0.0006)	(0.0029)
Urban	-0.0117 **	-0.0256 **
	(0.0009)	(0.0123)

Number of Individuals in pooled regrsn	5474
Number of Individuals*Years " "	116420
R Squared	0.33

Please Note: Age, education and own migration experience variables included in the regression but omitted from the table.

Table 7
The Effect of Network Access on Migration Propensity
LPM Estimates are from Table 5 regression
Standard Errors in Parentheses

	FIRST TRIPS		REPEAT TRIPS	
	LPM	**Individual Fixed Eff**	**LPM**	**Individual Fixed Eff**
Characteristic				
Access to:				
Father network indicator	0.0149 **	0.0105	0.0131	0.0218
	(0.0021)	(0.0253)	(0.0101)	(0.0291)
# of Sibling networks	0.0157 **	0.0285 **	0.0058 *	0.0248 **
	(0.0015)	(0.0040)	(0.0036)	(0.0055)
# of Sister networks	-0.0080 **	-0.0145 *	0.0136 *	-0.0136
	(0.0030)	(0.0082)	(0.0083)	(0.0125)
Number of Individuals in pooled regrsn			5474	5474
Number of Individuals*Years “ “			116420	116420
R Squared			0.33	0.50

Table 8
The Effect of Network Characteristics on Migration Propensity
LPM Estimates are from Table 5 regression
Standard Errors in Parentheses

	FIRST TRIPS		**REPEAT TRIPS**	
	LPM	**Individual Fixed Eff**	**LPM**	**Individual Fixed Eff**
Characteristic				
Access to:				
Father network indicator	0.0322 **	-0.0072	0.0472 *	0.0495
	(0.0049)	(0.0281)	(0.0252)	(0.0389)
# of Sibling networks	0.0196 **	0.0276 **	0.0149 **	0.0244 **
	(0.0022)	(0.0047)	(0.0047)	(0.0068)
# of Sister networks	-0.0116 **	-0.0243 **	0.0005	-0.0198
	(0.0042)	(0.0117)	(0.0117)	(0.0166)
Recency of:				
Age of father-led network (years)	-0.0005 **	-0.0002	-0.0009	-0.0015 *
	(0.0001)	(0.0005)	(0.0006)	(0.0009)
Age of sibling-led network (years)	-0.0010 **	-0.0000	-0.0023 **	-0.0013 *
	(0.0001)	(0.0004)	(0.0004)	(0.0007)
Permanency of:				
Father in US in survey year	0.0008	0.0034	0.0308	0.0012
	(0.0110)	(0.0568)	(0.0414)	(0.0677)
Sibling in US in survey year	0.0133 **	-0.0055	0.0237*	0.0268
	(0.0038)	(0.0103)	(0.0129)	(0.0188)
Sister in US in survey year	-0.0038	0.0277	0.0075	0.0125
	(0.0064)	(0.0188)	(0.0245)	(0.0321)
Number of Individuals			5466	5466
Number of Individuals*Years			116264	116264
R Squared			0.33	0.50

Appendix A

This appendix reports the instrumented regression results when the chain index of implicit agricultural prices (in 1980 pesos, Banco de Mexico) is used as a proxy for regional economic conditions. In the main text, the variable utilized is agricultural output. This section addresses potential problems of endogeneity involved with using an output measure to capture variation in economic conditions. As shown in Table A1, the results are very similar to those in Table 6 of the main text. Relatively favorable regional economic conditions as captured by high agricultural prices lessen the incentive for migration on both first and higher-order trips. The coefficients imply that a change of 20% in the price index would cause a 42% decrease in the probability of first-time migration and a 10% decrease in the annual probability of repeat migration.

Table A1
Determinants of Mexico-U.S. Migration on First and Repeat Trips
Method of Estimation: Two-Stage Least Squares with Robust Standard Errors
Standard Errors in Parentheses

Variable	**First Trip**	**Repeat Trips**
Migration Cost Measures		
Father Network Indicator	0.0149 **	0.0132
	(0.0021)	(0.0101)
# of Sibling Networks	0.0157 **	0.0058 *
	(0.0015)	(0.0036)
# of Sister Networks	-0.0080 **	0.0137 *
	(0.0030)	(0.0083)
Median coyote price ($100s)	-0.0075 **	-0.0444 **
	(0.0026)	(0.0106)
Migration Benefit Measures		
Mexican Economic Conditions		
Ln(Agric.Implicit Price Deflator)	-0.0407 **	-0.1049 **
	(0.0170)	(0.0520)
Ln(GDP/Pop)	0.0135	-0.0352
	(0.0144)	(0.0491)
U.S. Economic Conditions		
Unemployment rate (wghtd avg)	-0.0012 *	-0.0063 *
	(0.0007)	(0.0035)
Ln(GDP/pop)	0.0135	0.1050
	(0.0144)	(0.1441)

Number of Individuals in pooled regrsn	5474
Number of Individuals*Years " "	116420
R Squared	0.33

Please Note: Policy variables, time, urban, age, education, and own migration experience variables included in the regression but omitted from the table.